# *Acinetobacter baumannii* Infection and Transmission in the Military Health Care System

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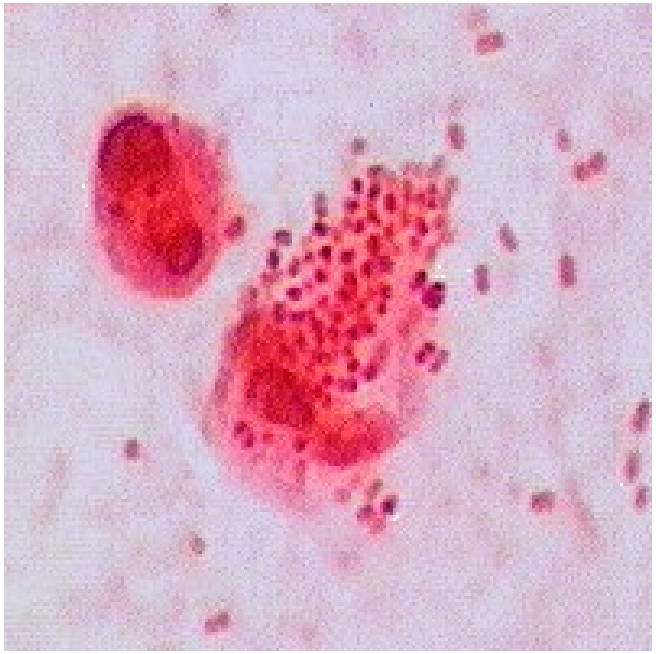
**Picture Source: LCDR Kyle Peterson, USNS**

# Outline

- Background
- *A. baumannii* transmission throughout MEDEVAC Sequence
  - Iraq
  - LRMC
  - WRAMC
- Infection control and nosocomial transmission
- Recommendations
- Future directions

# Background

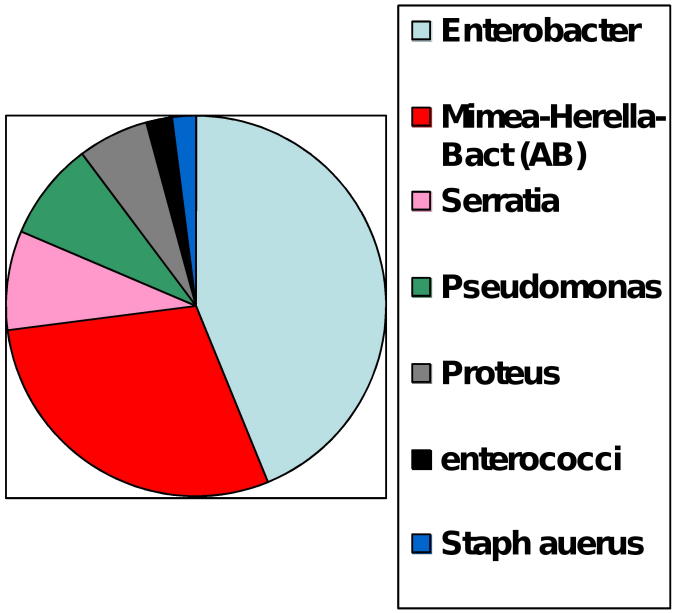
- Common nosocomial pathogen
  - Recognized pathogen in Vietnam war
  - *A. baumannii* seen almost exclusively in medical treatment facilities
  - VAP, Burn units, ICUs
- Infections, colonization or both noted
- Acinetobacter species are common skin contaminants, but not *A. baumannii*
- Difficult to eradicate
  - Very hard to eliminate (lives on surfaces for over 48 hrs)
  - Often is multi-drug resistant so acquisition is hard to treat
  - Persistence on human host is unknown (1-176 days in 1 recent abstract)



# Acinetobacter in Vietnam

- Study of wound infections at DaNang hospital in 68-69
- 30 critically ill patients
- 12 patients with bacteremia
- *JAMA* 1972:219(8), 1044-7.

**Bloodstream isolates by species**

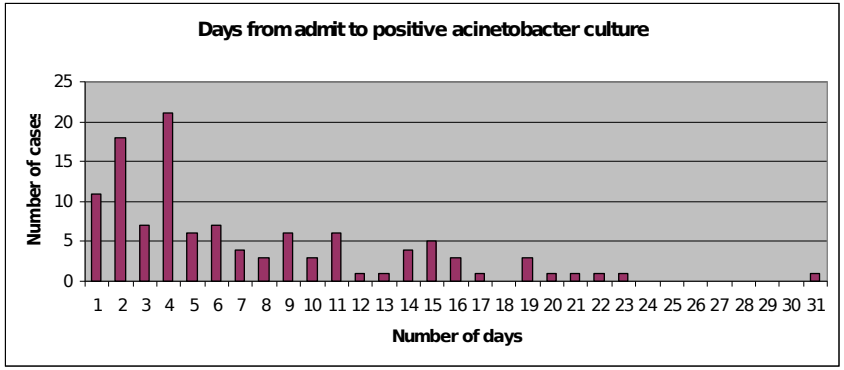


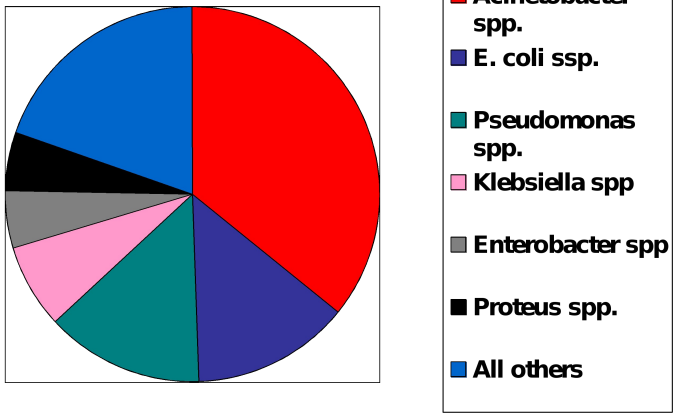
# Timeline

- 19 Mar 2003: OIF begins
- 21 Mar 2003: First LRMC Isolates seen
- April 2003: USNS Comfort notes increase in isolates of highly resistant *A. baumannii*
- June 2003: LRMC begins active surveillance program
- Summer 2004: Several nosocomial deaths at WRAMC and LRMC
- Aug 2004: EPICON directed by TSG
- Nov 2004:  MMWR article, other publications

# USNS Comfort 2003

- 23% Infected or colonized with MDR Acinetobacter spp.
- Positive cultures early in hospital course
- 80% of patients were Iraqis




Source: LCDR Kyle Peterson, NNMC

# Acinetobacter Theories

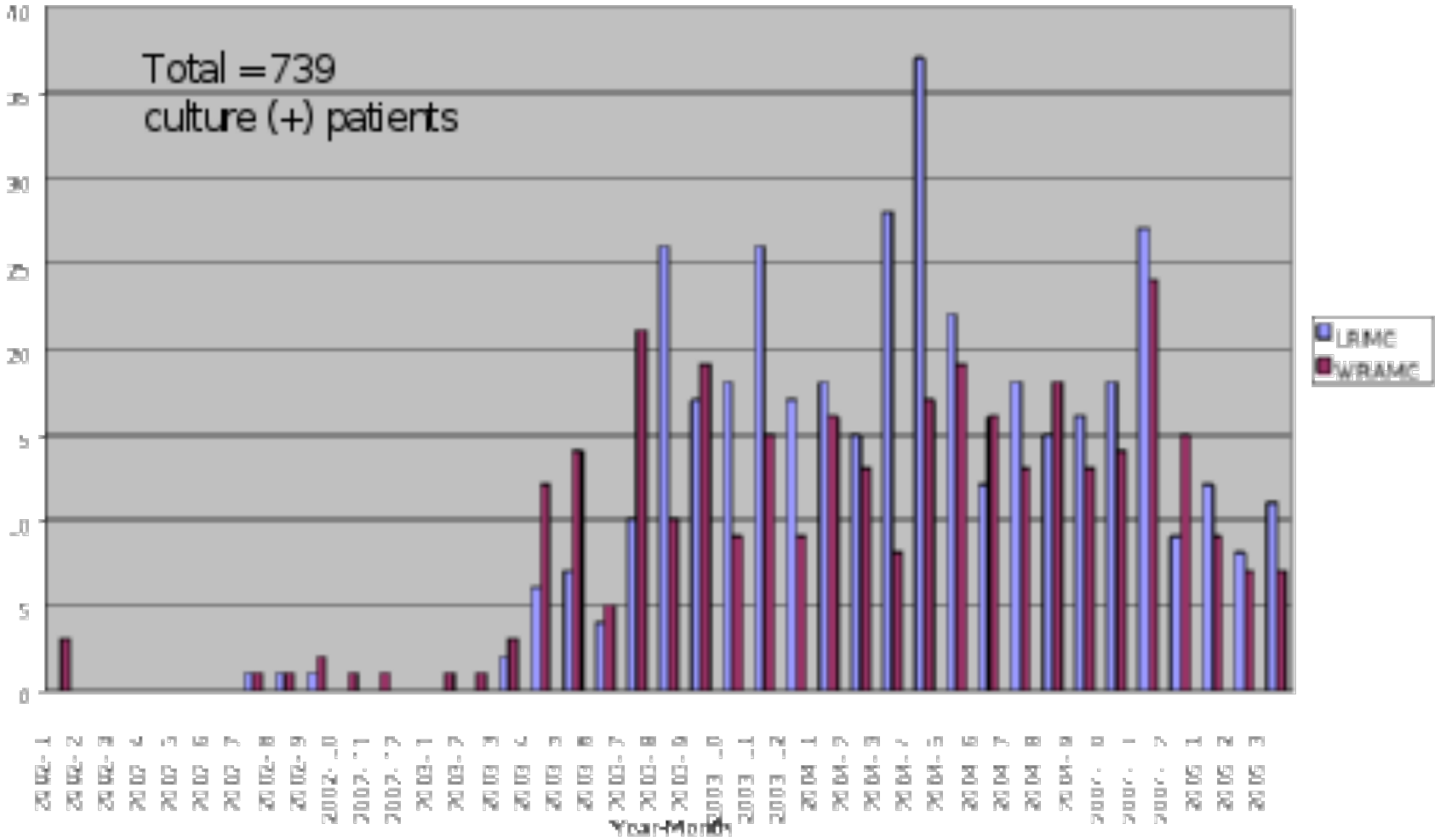
- Dirt in Iraq
- Propensity for colonization in the tropics
- Perioperative Ancef
- Cross-contamination of US troops by Iraqis
- Difficulty in eradication
  - Normal hospital setting difficult
  - Translation to MEDEVAC chain with multiple moving parts

# Counts of First Positive *A. baumannii* Culture per Infected or Colonized Patient

## Walter Reed Army Medical Center & Landstuhl Regional Medical Center

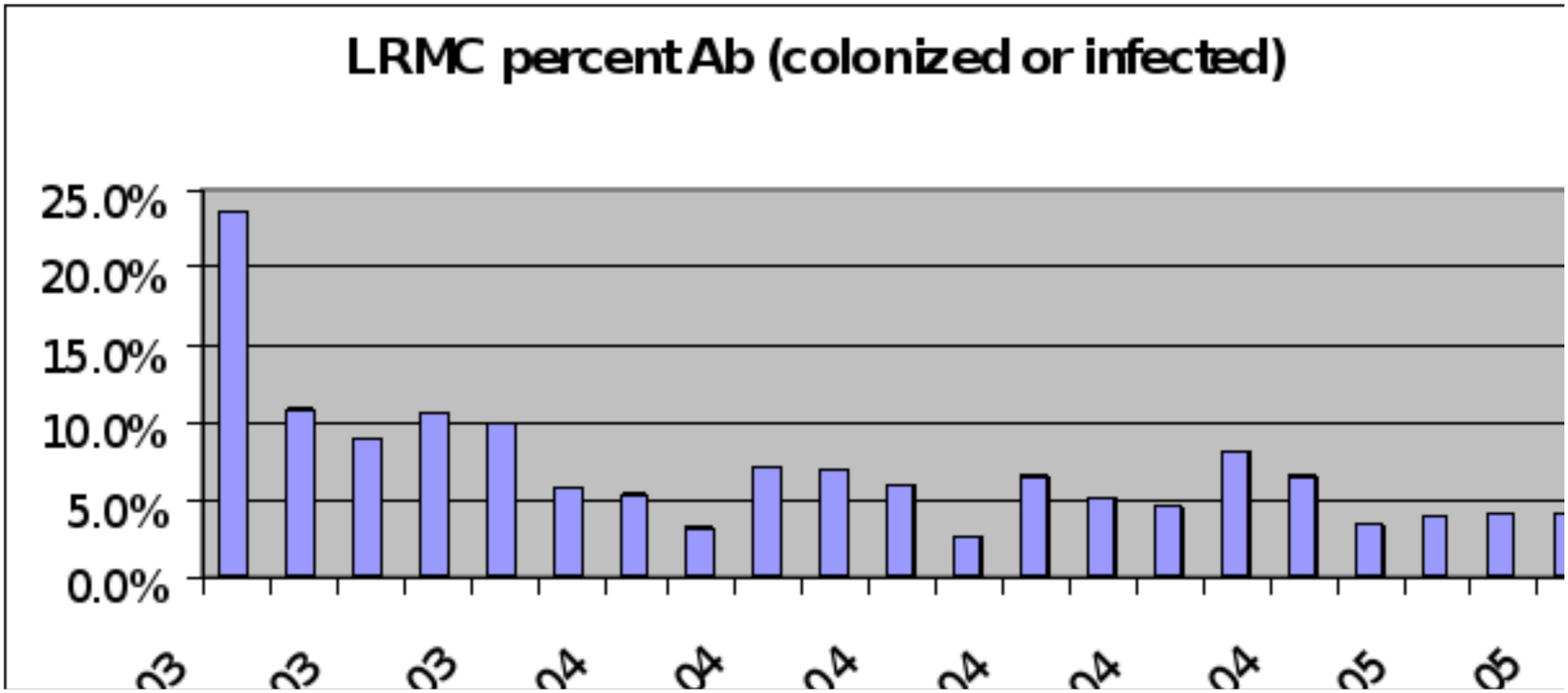
**January 2002 - March 2005**

**BY HOSPITAL; ANY SPECIMEN TYPE**



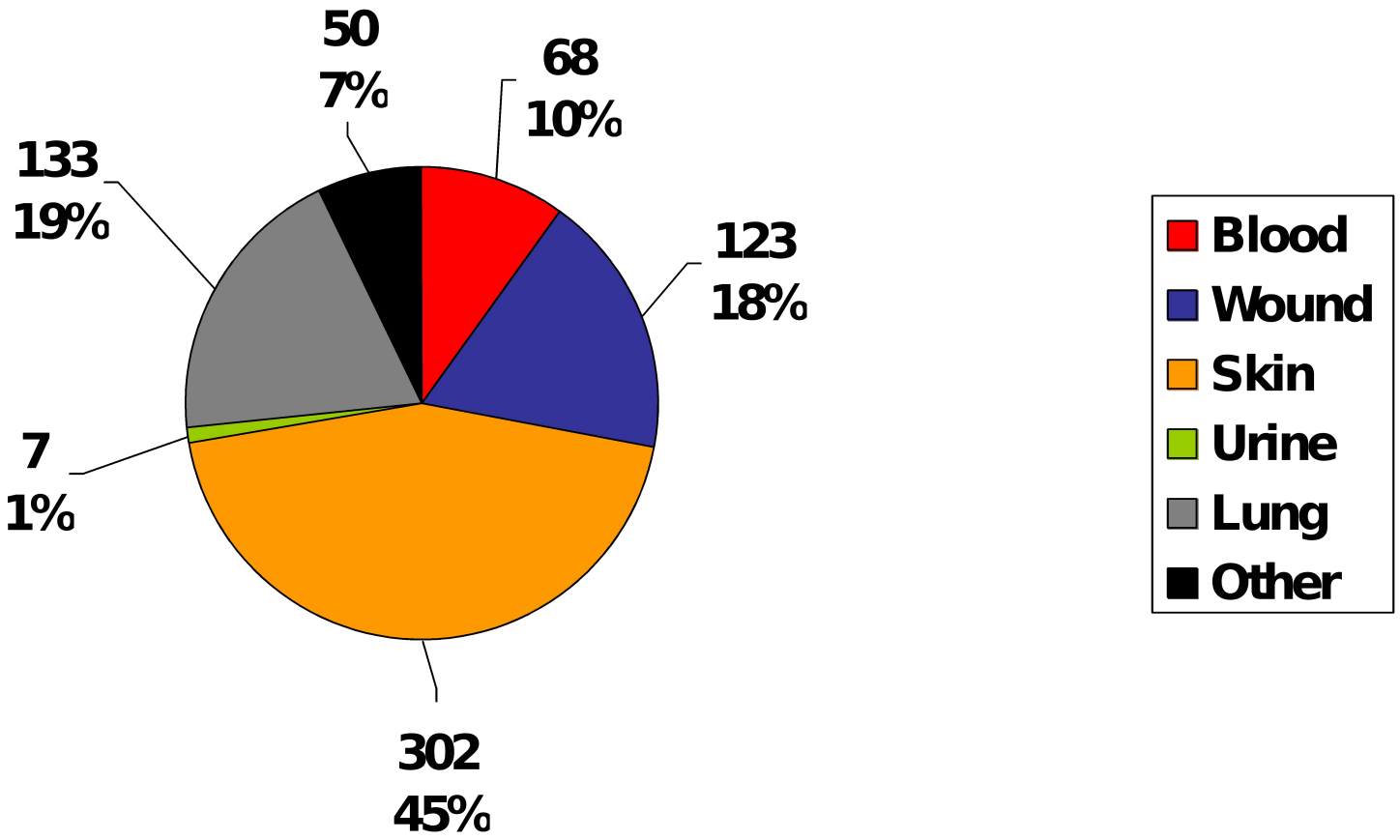

Source: EPICON Report No. 12-HA-01JK-04

# LRMC *A. baumannii* Infection Control Surveillance



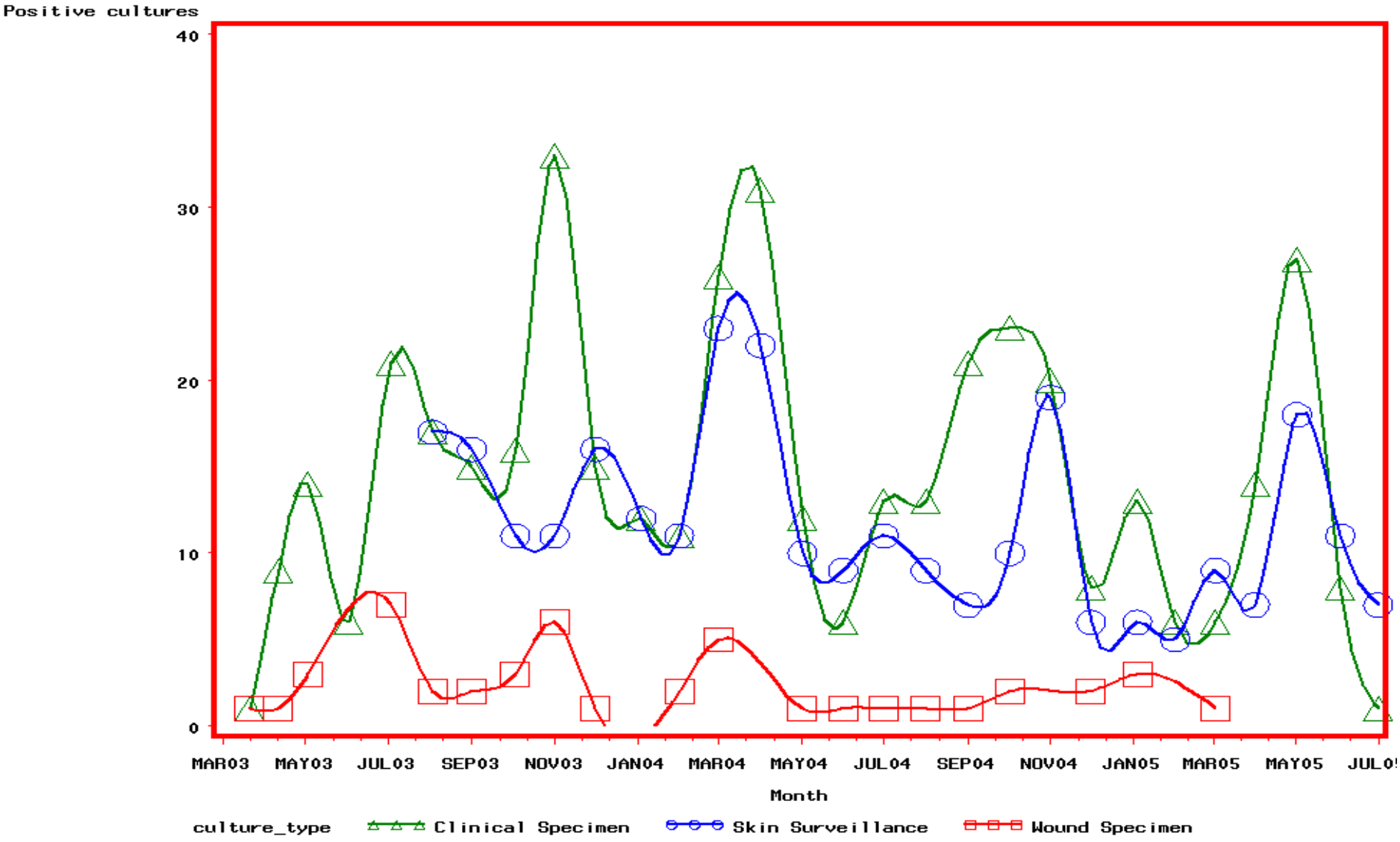

Source: Greg Deye and Abel Trevino, LRMC

# Sites of Acinetobacter Cultures, LRMC, January 2002 to April 2005

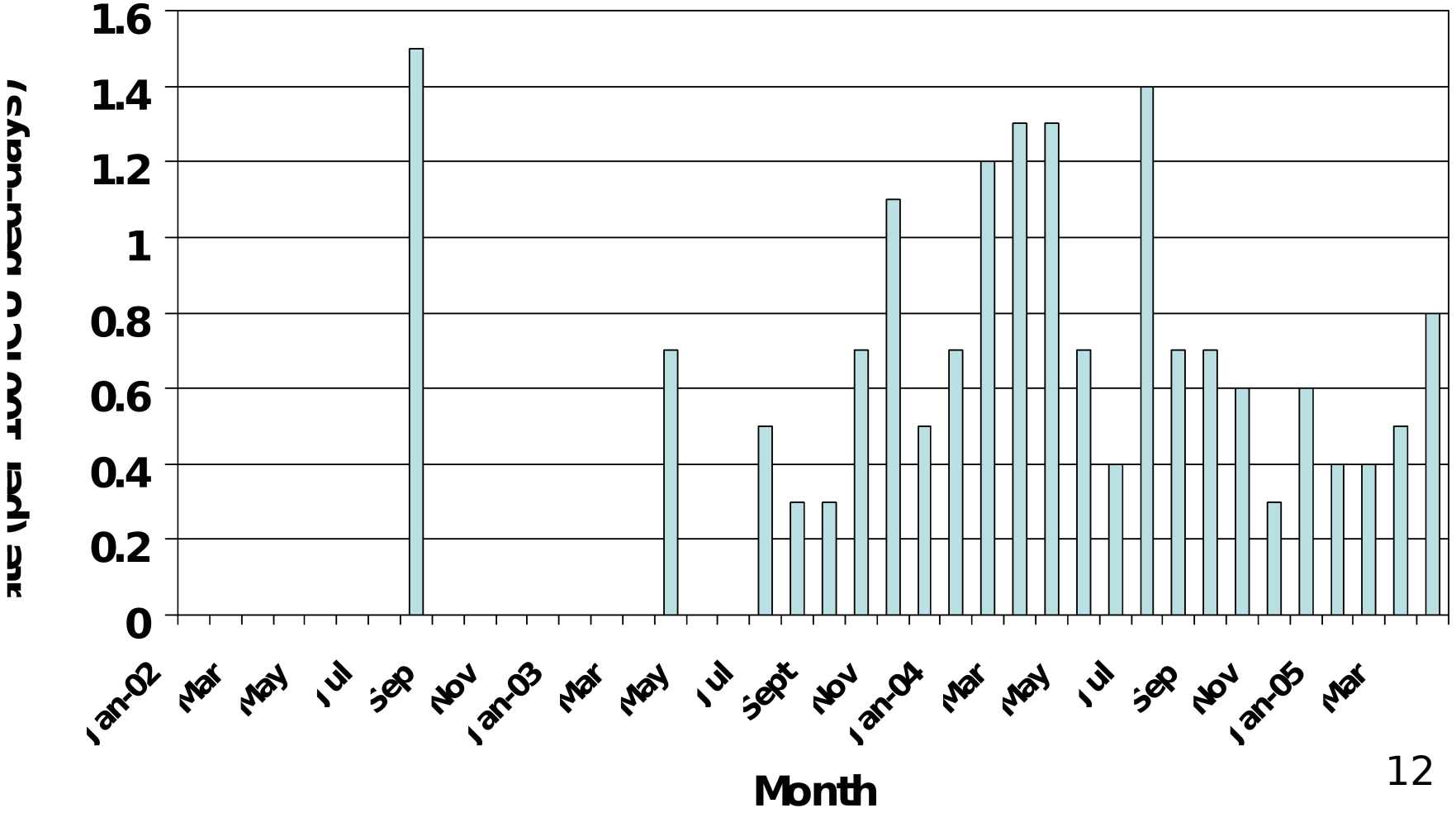



N=683

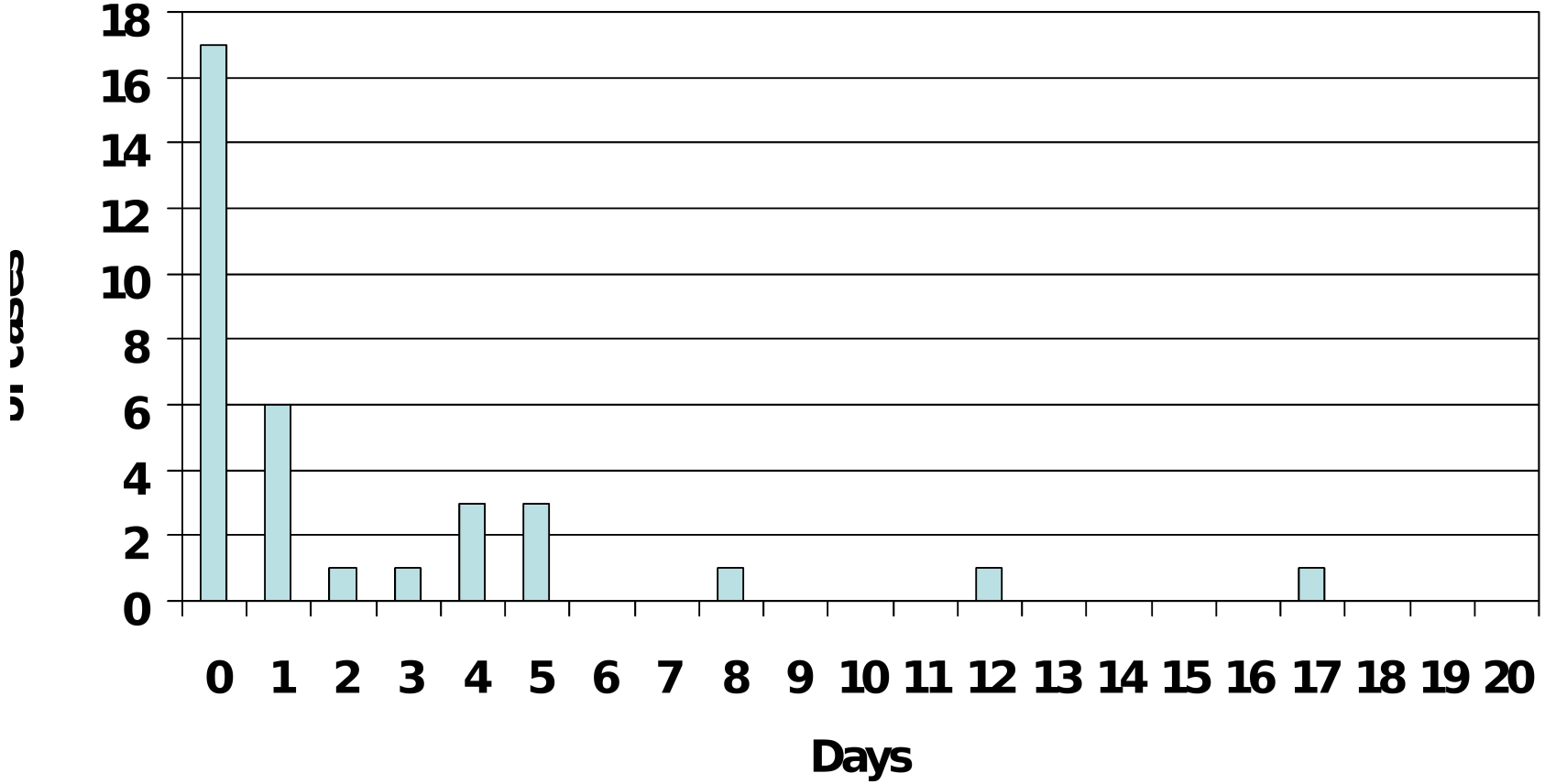
# Acinetobacter baumannii Surveillance and Clinical Cultures, Landstuhl Regional Medical Center, 2003—2005



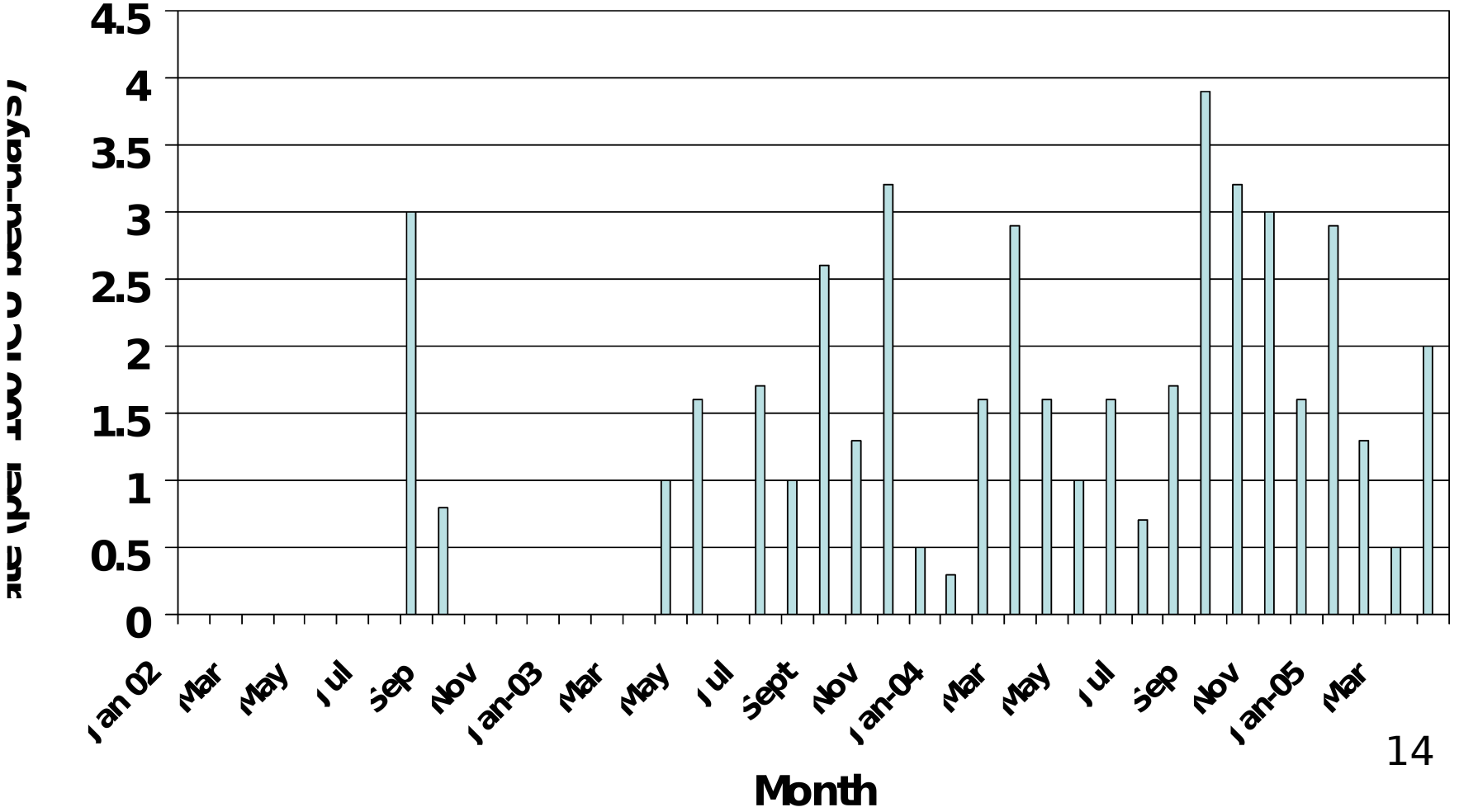
# Rate of Acinetobacter Bloodstream Infections, 2002-2005



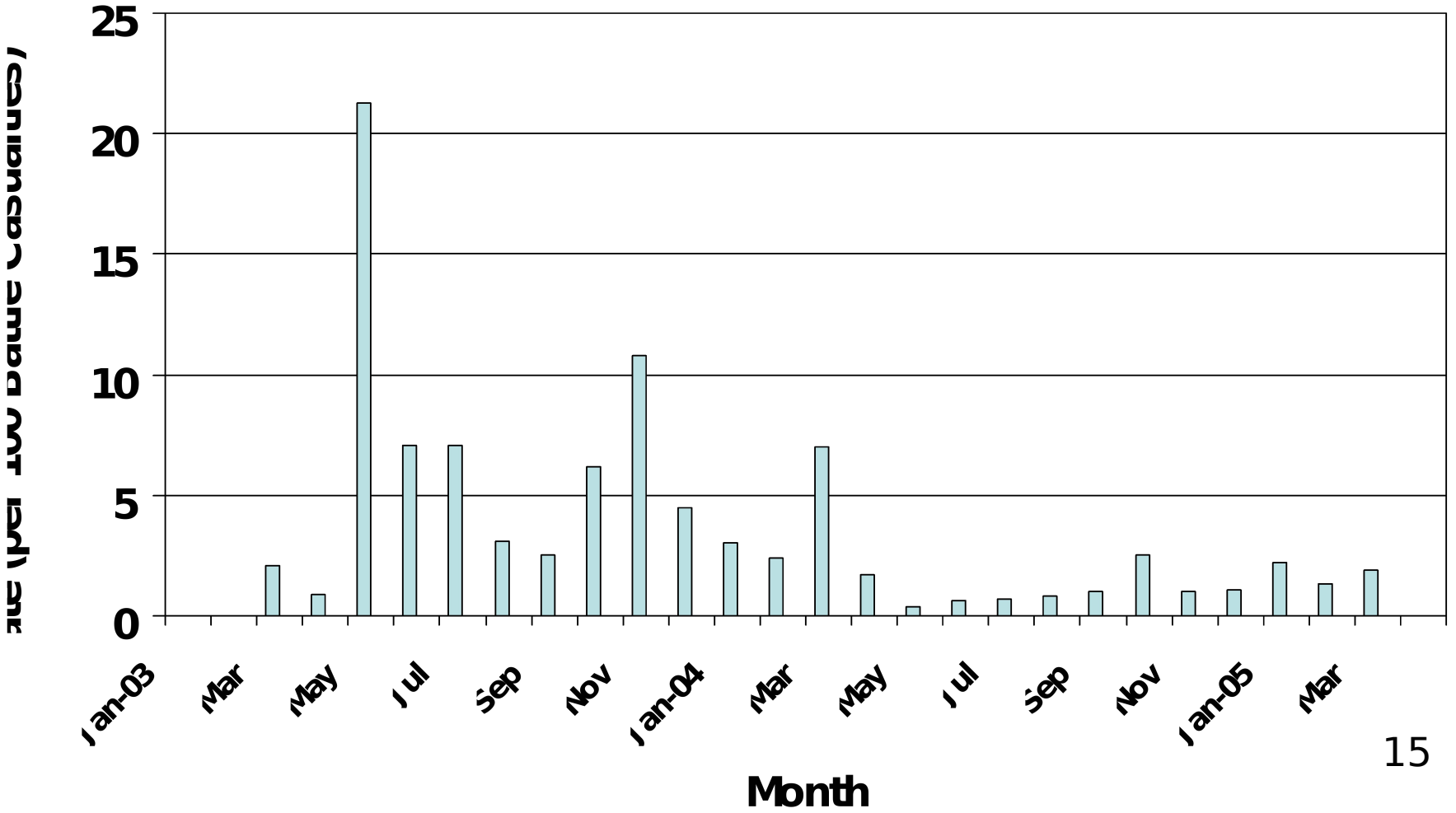
# Time from Admission to Collection of Positive Blood Culture



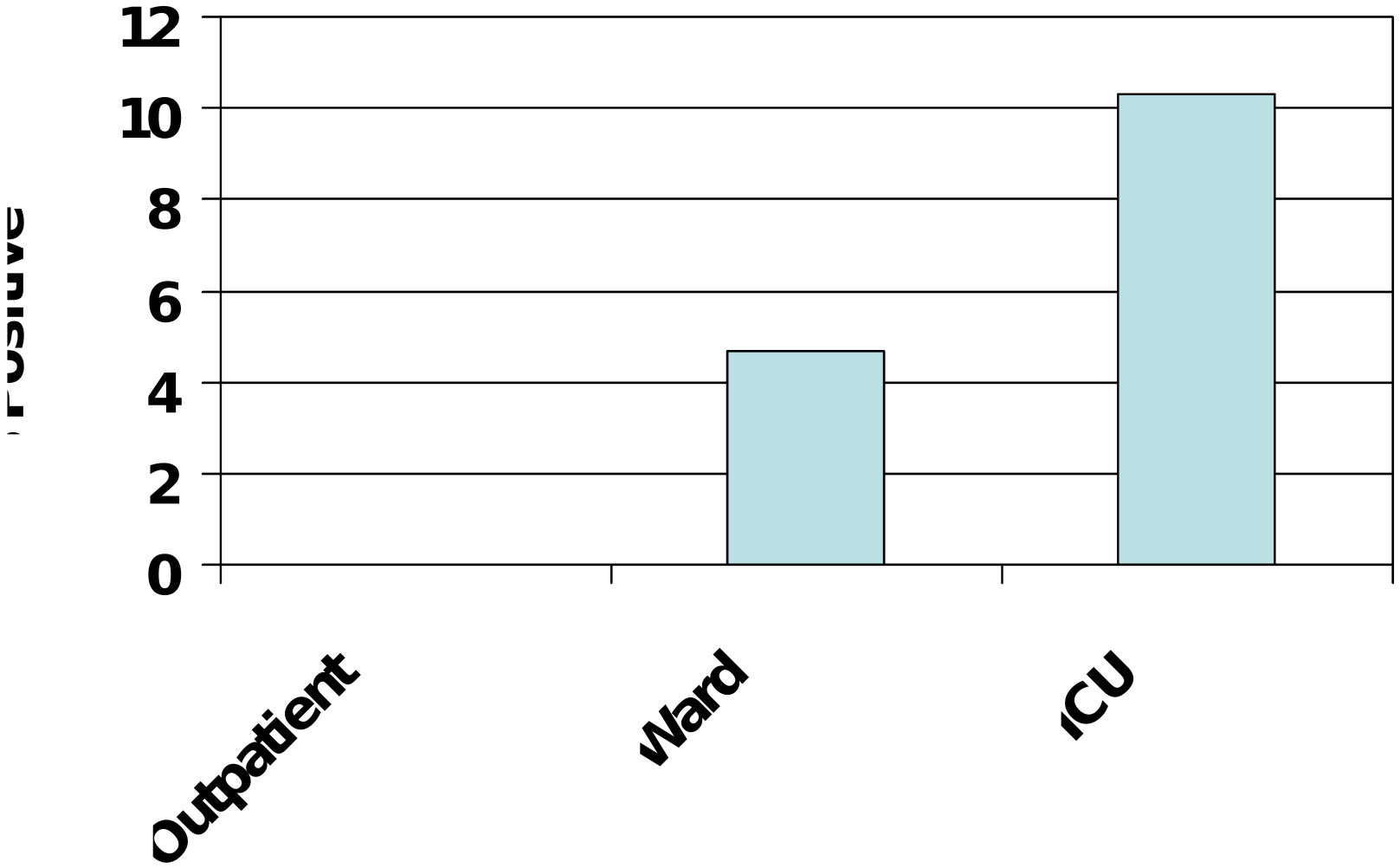
# Rate of Respiratory Cultures with Acinetobacter, 2002-2005

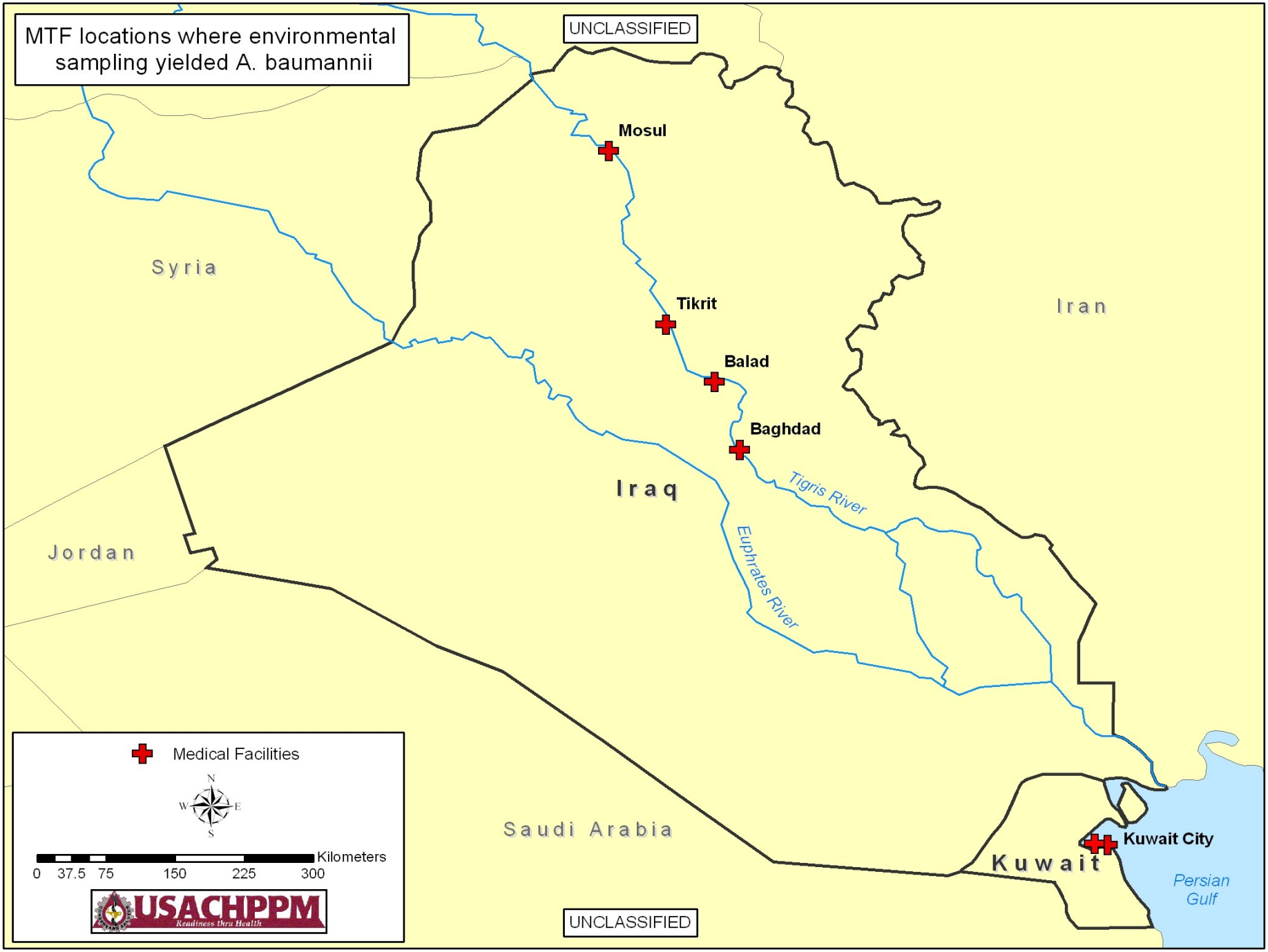


# Acinetobacter Wound Cultures, LRMC, 2003-2005



# Acinetobacter Colonizations by Patient Status on Arrival to LRMC




MTF locations where environmental sampling yielded A. baumannii
UNCLASSIFIED
Mosul
Tikrit
Balad
Baghdad
Syria
Iran
Iraq
Jordan
Saudi Arabia
Kuwait
Kuwait City
Tigris River
Euphrates River
Persian Gulf
Medical Facilities
N
W
E
S
Kilometers
0 37.5 75 150 225 300
USACHPPM
Readiness Thru Health
UNCLASSIFIED

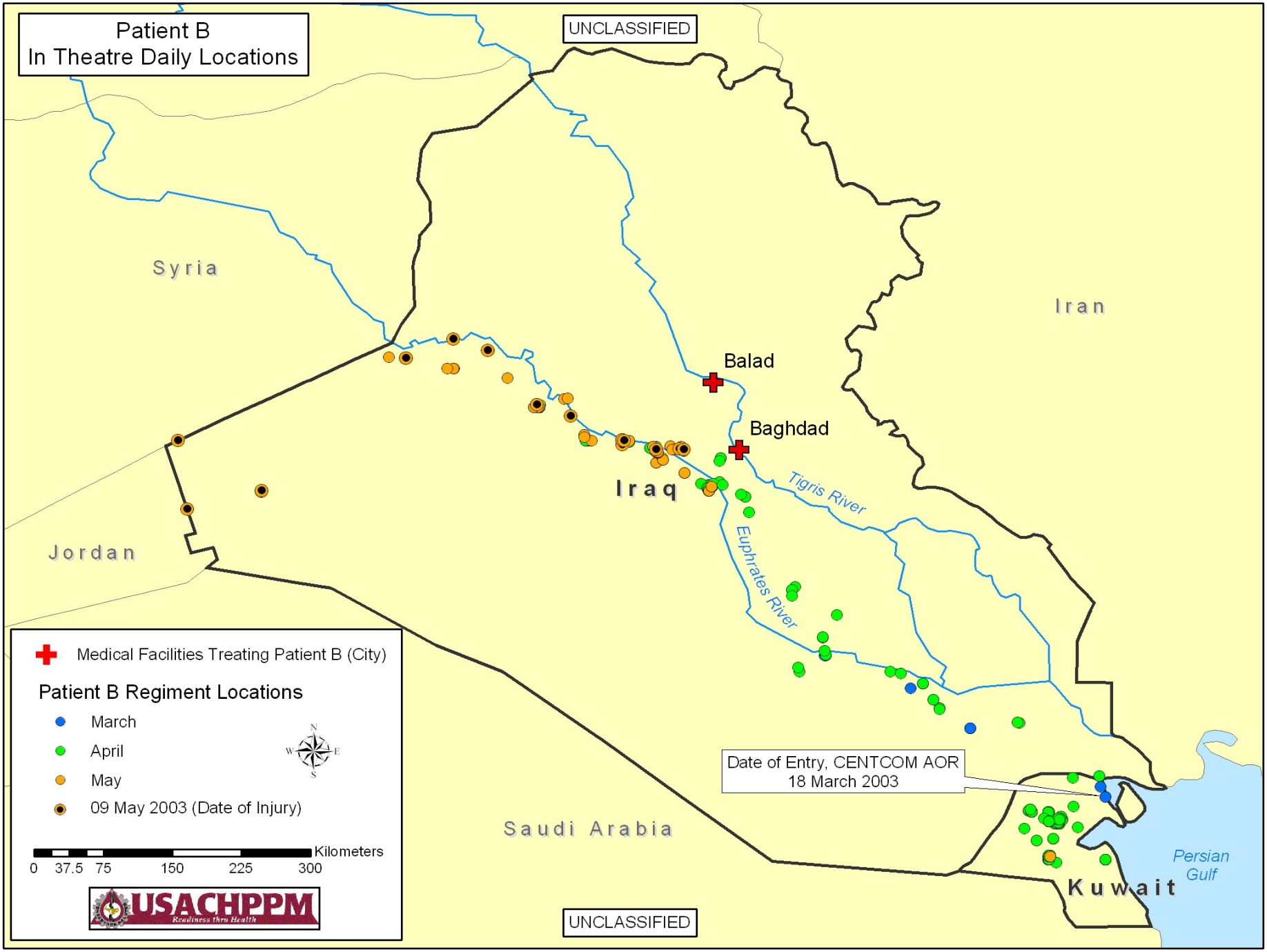
# MEDEVAC Patient

- Isolate OIFC 138
  - Source: sputum
  - Date: 11 May 03
  - Location: LRMC
- Isolate OIFC 137
  - Source: catheter tip
  - Date: 23 May 03
  - Location: WRAMC
- 100% similar to isolate from MTF B Operating Room

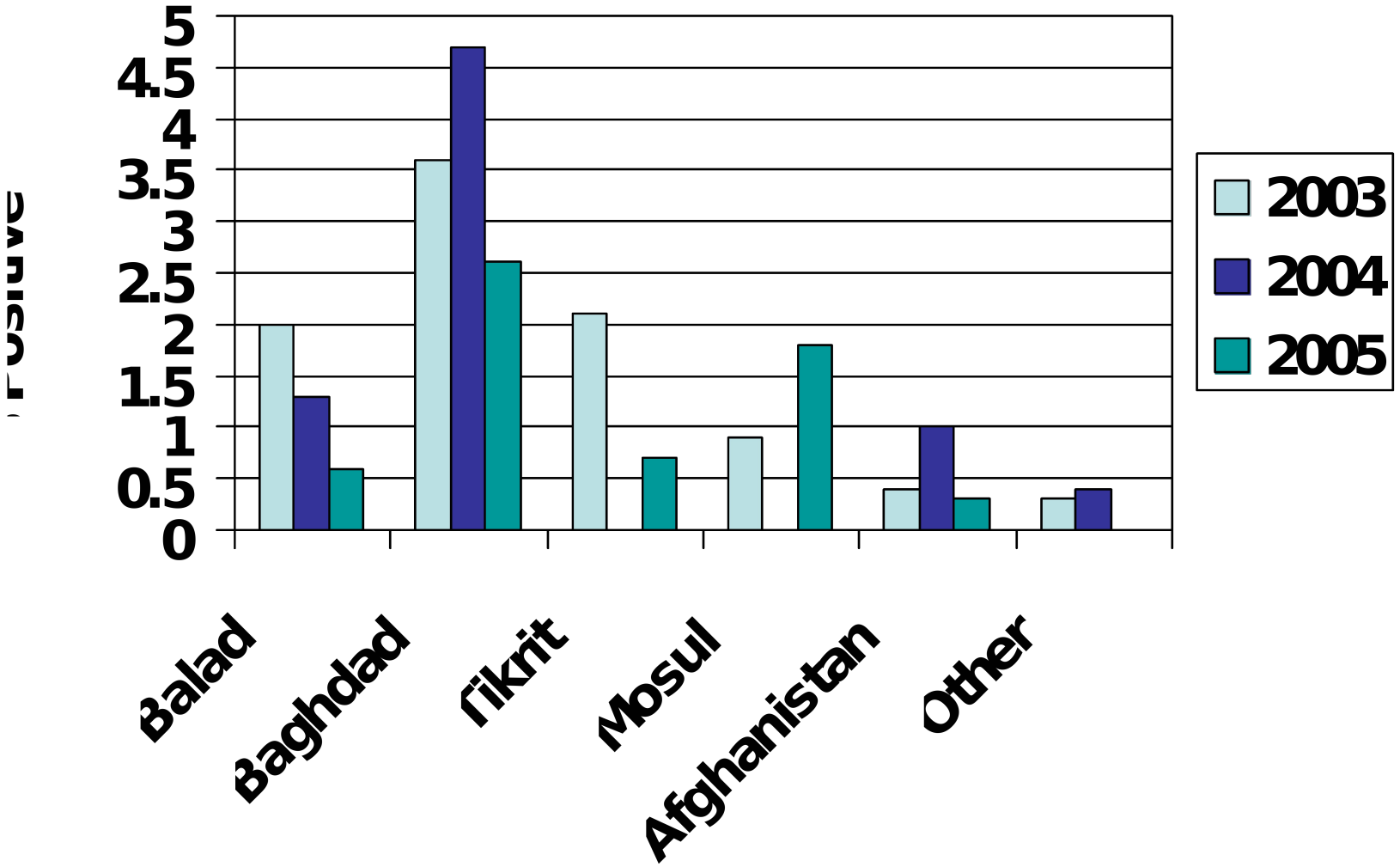
- Evacuation Sequence
  - MTF E (Balad)
    - 10 May 03
  - MTF B (Dogwood)
    - 10 May 03
  - LRMC
    - 11 May 03
  - WRAMC
    - 22 May 03



**Source: MAJ Paul Scott,**


Patient B
In Theatre Daily Locations
UNCLASSIFIED
Syria
Iran
Balad
Baghdad
Iraq
Tigris River
Euphrates River
Jordan
Saudi Arabia
Kuwait
Persian Gulf
Date of Entry, CENTCOM AOR
18 March 2003
Medical Facilities Treating Patient B (City)
Patient B Regiment Locations
March
April
May
09 May 2003 (Date of Injury)
N
W
E
S
Kilometers
0 37.5 75 150 225 300
USACHPPM
Readiness thru Health
UNCLASSIFIED

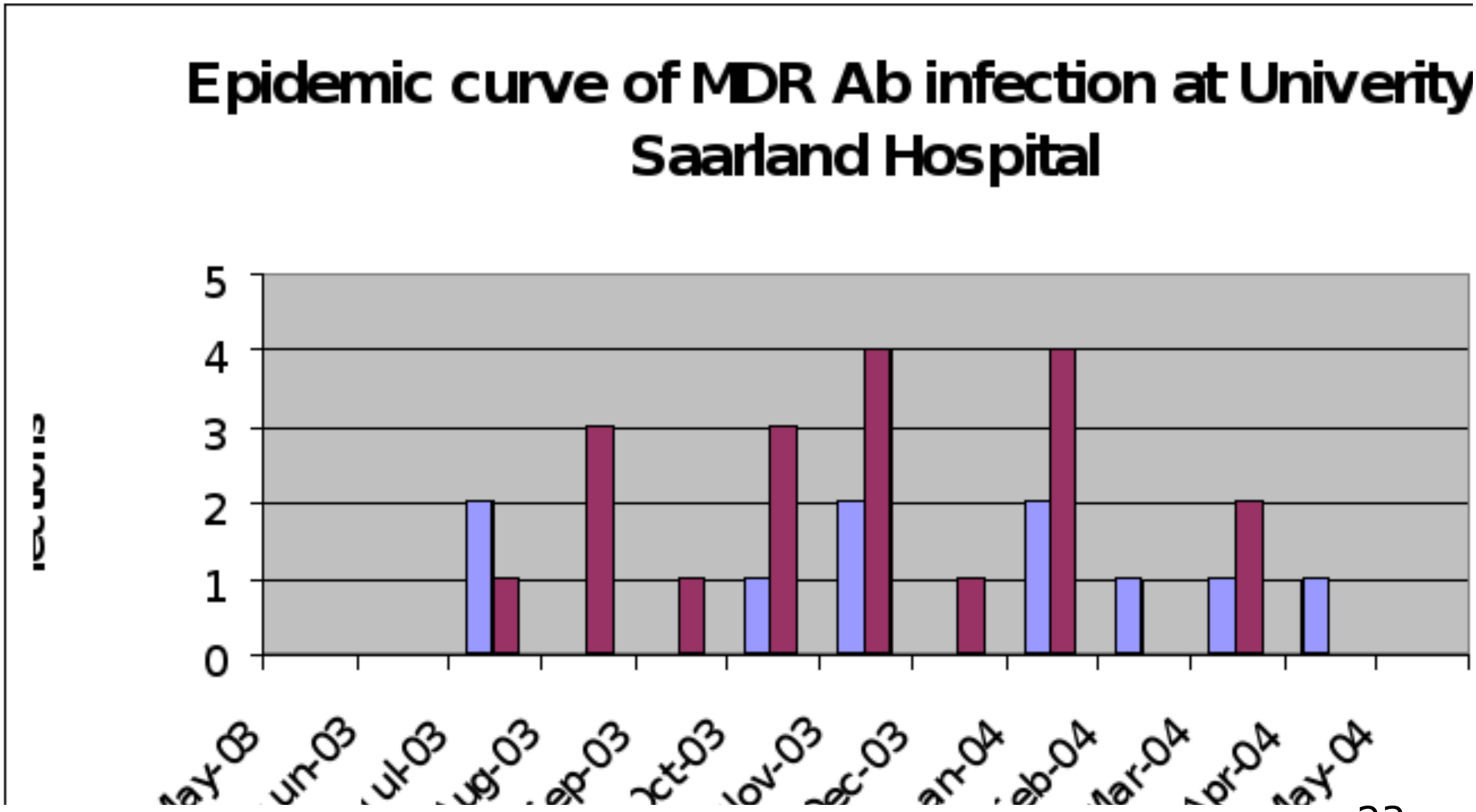
# Acinetobacter Infection By Referring Level III Facility



# Nosocomial Patient

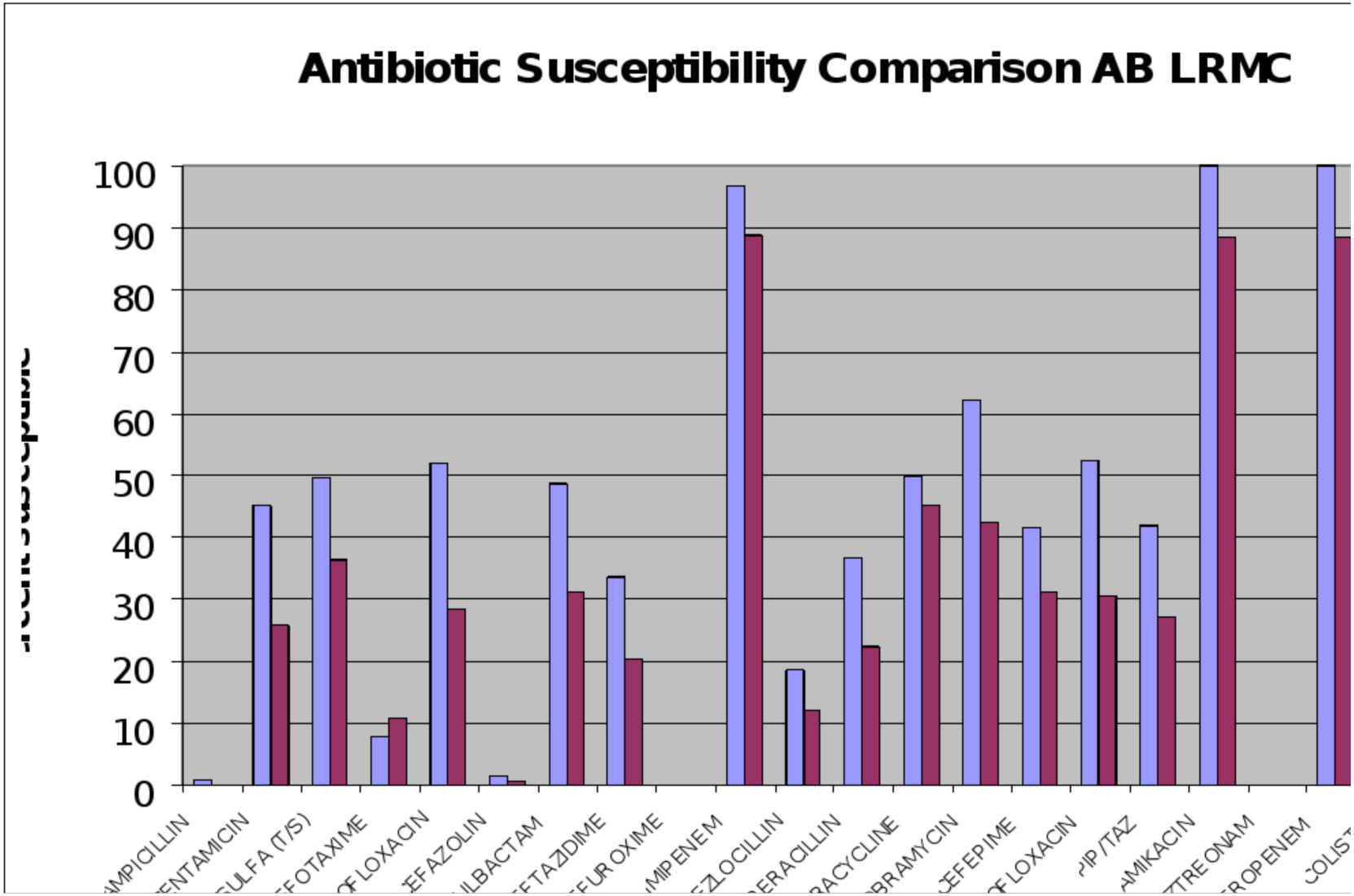
- LRMC
  - April 2004- 63yo woman admitted with COPD exacerbation
    - Admitted to med/surg ward (NOT ICU)
    - Developed Nosocomial Pneumonia due to MDR *Acinetobater baumannii*.
    - Only Acinetobacter patient with bacteremia not from OIF
    - Died of Sepsis

# Transmission at a Referral Hospital in Germany




**Source: Greg Deye, LRMC**

# Antibiotic Susceptibility




Source: Greg Deye and Wade Aldous, LRMC

# LRMC Admission Skin Isolates

| Abx | 2003 %S | 2004 %S | p |
|---|---|---|---|
| Amp | 2.083333 | 0 | 0.213 |
| Gent | 65.57377 | 32.76836 | 0.0001 |
| T/S | 64.58333 | 40.11299 | 0.0032 |
| Cipro | 68.85246 | 36.15819 | 0.0001 |
| Amp/Sul | 56.25 | 36 | 0.0475 |
| Ceftaz | 49.15254 | 25 | 0.001 |
| Imi | 97.91667 | 90.22989 | 0.1316 |
| Pip | 54.09836 | 28.24859 | 0.0005 |
| TCN | 70.96774 | 51.42857 | 0.0513 |
| Tobr | 73.77049 | 44 | 0.0001 |
| Cefepime | 51.6129 | 37.5 | 0.1646 |
| Levoflox | 65.71429 | 38.85714 | 0.0047 |
| Amikacin | 100 | 100 | 1 |
| Meropenem | 100 | 87.80488 | 0.5689 |

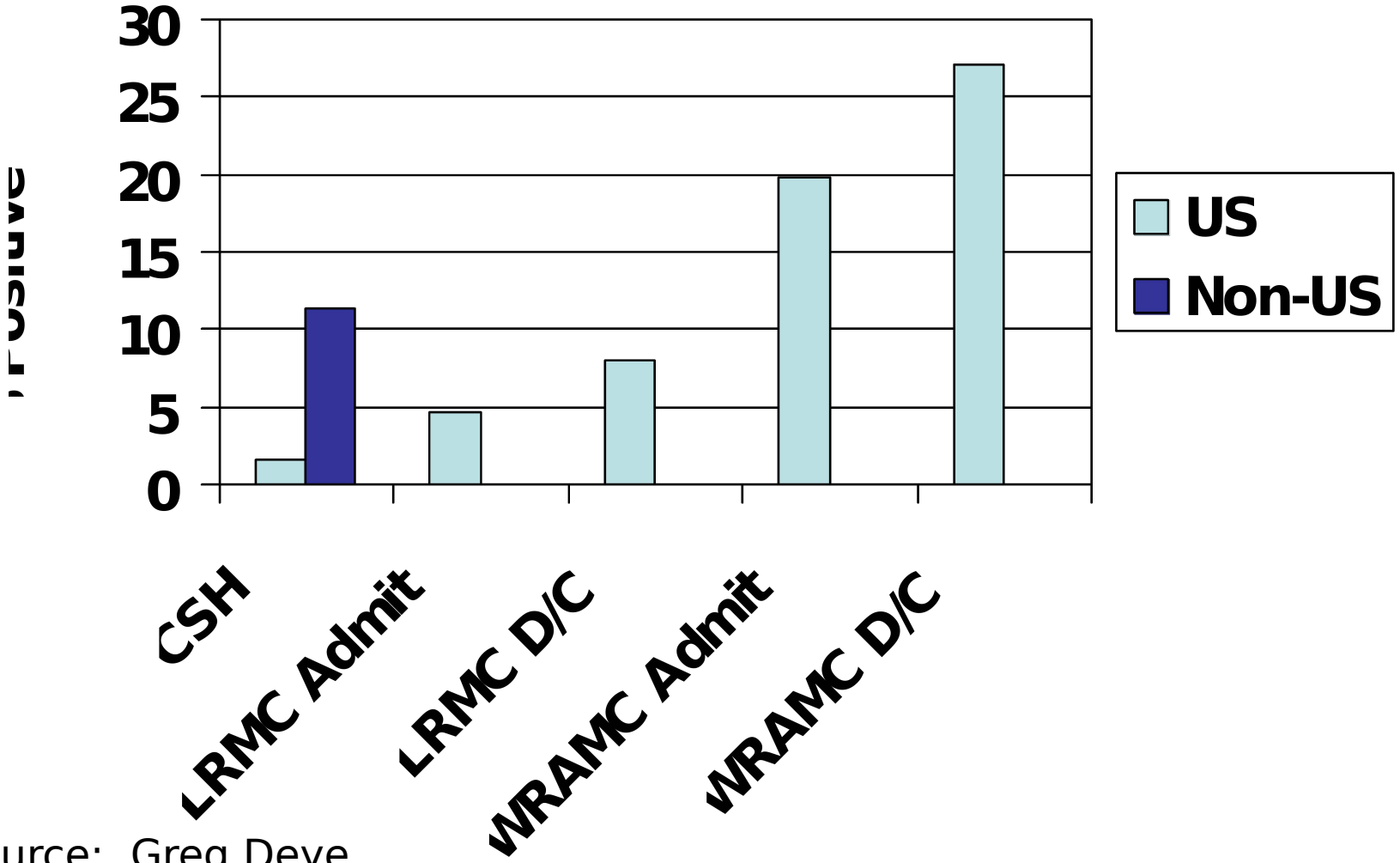


Source: Greg Deye and Wade Aldous, LRMC

# Case-Control Study of ICU Admissions With and Without Ab Bloodstream Infections

| Variable | Odds Ratio | p-value |
|---|---|---|
| Transport>48 hrs | n/a | 0.01 |
| FST exposure | 2.7 | 0.13 |
| Baghdad | 2.8 | 0.07 |
| Antibiotic use | 2.0 | 0.20 |
| IED | 0.8 | 0.80 |
| Intubated | 2.6 | 0.06 |
| Blood products | 5.0 | 0.00 |
| Civilian | 3.0 | 0.08 |

# Acinetobacter Cultures at Selected Stages in the Military Healthcare System




Source: Greg Deye, LRMC

# Comparing “Success”

- Different culturing practices
  - Sites: Nares, wound, skin
  - Number of cultures
  - Access to culture capability
  - Culturing technique
  - Time to culture
  - Laboratory practices
- Uncertain relative contribution of nosocomial transmission, control measures throughout the MHS

# Concordance Data

- Comparison of LRMC and WRAMC culture concordance from May to July 2005
- LRMC rates
  - Positive on admission = 4.0% (25/623)
  - Positive on discharge = 8.7% (13/149)
  - ICU patients on admission = 4.6% (8/176)
  - ICU patients on discharge = 8.3% (6/72)
- LRMC study group
  - Positive on admission = 3.6% (3/84)
  - Positive on discharge = 11.1% (4/36)
  - ICU admission = 4.2% (3/72)
  - ICU discharge = 10.7% (3/28)
- WRAMC study group, n=89
  - Positive on admission = 14.6% (13/89)
    - Axilla 10.1% (8/79)
    - Groin 12.3% (9/73)
  - ICU patients at LRMC = 66% (59/89)

# Concordance Data, LRMC Admission vs. Discharge Skin Surveillance Cultures, May-July 2005

| | D/C Cx + | D/C Cx - | Total |
|---|---|---|---|
| Admit Cx + | 5 | 4 | 9 |
| Admit Cx - | 8 | 132 | 140 |
| Total | 13 | 136 | 149 |

McNemar's test, p=0.25

Kappa=0.41

LRMC Overall admission rate= 4.0%
This study = 6.0%

# Concordance Data, LRMC Discharge vs. WRAMC Admission,

## Skin Surveillance Cultures, May-July 2005

| | WRAMC Admit + | WRAMC Admit - | Total |
|---|---|---|---|
| LRMC D/C + | 2 | 2 | 4 |
| LRMC D/C - | 2 | 30 | 32 |
| Total | 4 | 32 | 36 |

McNemar's test, p=1.0

Kappa=0.44

Note: 78% were ICU patients at LRMC (28/36)

# Concordance Data, WRAMC Groin vs. Axilla Admission,

## Skin Surveillance Cultures, May-July 2005

| | Groin Cx + | Groin Cx - | Total |
|---|---|---|---|
| Axilla Cx + | 4 | 4 | 8 |
| Axilla Cx - | 5 | 50 | 55 |
| Total | 9 | 54 | 63 |

# Infection Control Challenges

- Lack of hand hygiene products and sinks
  - 40-60% compliance with hand washing
- Shortage of gowns
- Repeated shortages of antibiotics
- Cohorting of patients to achieve infection control
- **Retroactive** vs. **proactive**
  - Wait for lab positives rather than up front isolation

# Control Measures

- Surveillance
- Education
- Isolation
  - Not described in literature for GNRs (MRSA only)
  - No clear APIC, SHEA guidelines
  - MDR Pseudomonas clearly not transmitted person/person
  - MDR Acinetobacter-strong evidence of person-person and surfaces
- Decontamination
- Hand washing enforcement
- Barrier precautions
- Appropriate antibiotic use and guidelines
- Topical medications aimed at elimination?
- Cohort patients
- Shut down infected units

**Source: NCID, CDC Website**


# Campaign to Prevent Antimicrobial Resistance

Centers for Disease Control and Prevention

National Center for Infectious Diseases

Division of Healthcare Quality Promotion

*Clinicians hold the solution!*

➢*Link to:*
*Campaign to Prevent Antimicrobial Resistance Online*

# 12 Steps to Prevent Antimicrobial Resistance: Hospitalized Adults

## Prevent Infection

1. Vaccinate
2. Get the catheters out

## Diagnose and Treat Infection Effectively

3. Target the pathogen
4. Access the experts

## Use Antimicrobials Wisely

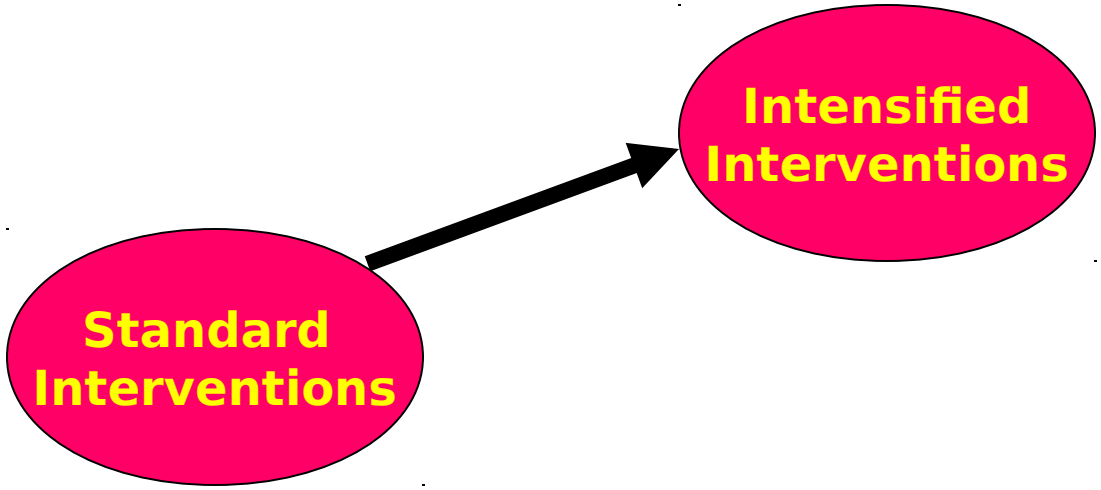
5. Practice antimicrobial control
6. Use local data
7. Treat infection, not contamination
8. Treat infection, not colonization
9. Know when to say “no” to vanco
10. Stop treatment when infection is cured or unlikely

## Prevent Transmission

11. Isolate the pathogen
12. Break the chain of contagion

**Source: NCID, CDC Website**

# Draft HICPAC Isolation Guideline: Intensified MDRO Prevention Interventions




- Evidence of ongoing transmission
- Prevalence of target MDRO has exceeding institutional goals
- First case of epidemiologically important MDRO



Source: L. Clifford McDonald, CDC

# Recommendations

- A dedicated IC practitioner at all level III and higher
- Standardized IC practices in place at all level III and higher facilities.
- Standardized surveillance with one technique (ax/groin) for all inpatients coming from theater for all MTFs, including level III. This implies microbiology capability able to support this surveillance.
- Standardized reporting requirement all level III and higher
- Improved documentation at all levels of care
- Inspection or reporting mechanisms where compliance with these measures will be verified

# Conclusions

- *A. baumannii* is causing significant clinical disease
  - Once established, it is difficult to eradicate
  - Nosocomial spread and deaths have occurred
- Optimal Infection Control practices critical
- Field setting
  - Dedicated assets in field settings
  - Surveillance and lab capabilities in field setting
- MHS wide
  - Standardize surveillance for more meaningful comparisons